AIDS
MEMORANDUM
Acquired Immune Deficiency Syndrome

National Institute of Allergy and Infectious Diseases

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IN THIS ISSUE

GROUND RULES FOR USE OF THE AIDS MEMORANDUM

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CORRELATION BETWEEN EXPOSURE TO HTLV-III AND THE DEVELOPMENT OF AIDS

Epidemiologic data and other kinds of evidence have accumulated which indicate that AIDS is caused by an infectious T lymphotropic agent transmitted by intimate contact, whole blood, or separated blood components (Curran JW, Lawrence DN, Jaffe H, et al: N Engl J Med., 1984, 310:69-75; Scott GB, Buck BE, Letterman JG, et al: N Engl J Med., 1984, 310:76-81). We originally proposed that members of the human T cell leukemia-lymphoma virus (HTLV) family of human retroviruses were prime candidates for the cause of AIDS (Gallo RC, Sarin PS, Gelmann EP, et al: Science, 1983, 220 (4599):865-867). Of these, HTLV-I was the most frequently isolated and best characterized. It and its variants are endemic in Africa and may have originated there (Gallo RC, Sliski A, Wong-Staal F: Lancet, 1983, 2:962-963). Africa may also be the location of origin of AIDS (Ibid).

These human retroviruses are T lymphotropic, preferentially infect cells with a helper phenotype (OKT4/leu3a$^+$), and, under natural conditions, are transmitted from person to person by intimate contact or in blood or blood products (Gallo RC: in Franks LM, Wyke LM, Weiss RA (Eds): Cancer Surveys, Oxford University Press, Oxford, 1984, in press). Like some other retroviruses, such as feline leukemia virus, HTLV isolates can have direct effects on T lymphocyte functional properties. In addition, HTLV-infected cells produce many cell-regulating factors, including those having suppressive effects (Salahuddin SZ, Markham PD, Lindner SG, et al: Science, 1984, 223(4637):703-707).

Numerous isolates of retroviruses which were T lymphotropic but which, in preliminary experiments, did not have significant immunological cross-reactivity with type-specific antibodies to HTLV-I and HTLV-II (the first two HTLV subclasses characterized) have been made in our laboratory from patients with AIDS and pre-AIDS since November 1982. Characterization of these viruses, named HTLV-III, remained laborious because of the cytopathic effects of the viruses on infected cells. Recently, permissive subclones of a permanently growing cell line were established which yielded virus in large amounts. Consequently, large quantities of HTLV-III could be made and reagents--proteins, immunological products, and nucleic acids--could be developed for characterizations and comparisons (Popovic M, Sarngadharan MG, Read E, et al: Science, 1984, 224(4648): 497-500).

Samples of peripheral blood, bone marrow, and serum from a large number of AIDS and pre-AIDS patients were collected, processed, and tested for the presence of HTLV-III or the presence of antibodies to viral proteins (Gallo RC, Salahuddin SZ, Popovic M, et al: Science, 1984, 224(4648):500-503). ELISA and Western blot procedures were used for detecting anti-HTLV-III antibody in sera and/or plasma from patients and controls (Sarngadharan MG, Popovic M, Bruch L, et al: Science, 1984, 224 (4648):506-508).

As summarized in Table 1, the retrovirus, HTLV-III, was isolated from the cells of a large proportion of the AIDS patients examined (30-50%) and from an even higher number of the pre-AIDS samples tested (87%). On the other hand, HTLV-III was isolated from only one of 26 nonpromiscuous homosexual donors; this was the one person in this group who later developed AIDS. HTLV-III was not found in 125 samples from normal heterosexual donors. The incidence of

virus isolations from the AIDS samples is an underestimate of the true frequency with which the virus is associated with AIDS, since many tissue specimens, particularly those received from terminal AIDS patients, had a low viable cell number.

TABLE 1
HTLV-III ISOLATES FROM AIDS AND PRE-AIDS PATIENTS AND CONTROLS

Donor Diagnosis	Number Tested	% Retrovirus Positive
Adult AIDS with opportunistic infection	25	50
Adult AIDS with Kaposi's sarcoma	43	30
Juvenile AIDS	8	30
Pre-AIDS, chronic lymphadenopathy	30	87
Mothers of juvenile AIDS	4	75
Clinically normal nonpromiscuous homosexuals	26	4
Clinically normal heterosexuals	125	0

Table 2 shows the frequency with which antibody to HTLV-III was detected in sera of various test groups. Exposure to the virus was apparent in almost all of the AIDS and lymphadenopathy patients, in a high proportion of intravenous drug users, and in many homosexual men. Normal controls and controls ill with diseases unrelated to AIDS showed no evidence of exposure to the virus.

TABLE 2
ANTIBODY TO HTLV-III DETECTED IN SERA OR PLASMA FROM AIDS AND PRE-AIDS PATIENTS AND CONTROLS

Donor Diagnosis	Number Tested	% Positive
AIDS	49	88
Pre-AIDS, chronic lymphadenopathy	14	79
Intravenous drug abusers	5	60
Homosexual men (high-risk areas)	17	35
Normal donors	163	<1
Acute mononucleosis	4	0
Lymphatic leukemia	8	0

Like other members of the HTLV family, HTLV-III is an exogenous T lymphotropic retrovirus which appears to preferentially affect OKT4/leu3a$^+$ T cells. It contains a high molecular weight, Mg^{++}-requiring reverse transcriptase and other structural proteins similar in size to antigens of HTLV-I and HTLV-II (Schupbach J, Popovic M, Gilden R, et al: Science, 1984, 224(4648):503-505). Immunological comparisons have shown antigenic homologies among the three subgroups of HTLV (Sarngadharan MG et al, submitted), and recent molecular analyses of the genome of HTLV-III show that it contains nucleotide sequences which are homologous with sequences in the genomes of HTLV-I and HTLV-II (Arya S et al, submitted). Finally HTLV-III has the retrovirus-unique X sequence region at the 3' end of the genome. These findings clearly define HTLV-III as a member of the HTLV family.

Other retroviruses have been detected in cells of AIDS and pre-AIDS patients. The first member of the HTLV family which we identified in such cells belonged to the HTLV-I subgroup (Gallo RC, Sarin PS, Gelmann EP, et al: Science, 1983, 220(4599):865-867). HTLV-I proviral DNA was detected in T lymphocytes from two additional AIDS patients (Gelmann EP, Popovic M, Blayney D, et al: Science, 1983, 220(4599):862-865), and HTLV-I-related antigens were found in T cells from several other patients (unpublished observation). Exposure to HTLV-I was detected in sera of about 15% of AIDS patients (>100 patients were tested) in experiments using either proteins from disrupted HTLV-I or the purified structural protein, p24, to detect specific antibodies (Robert-Guroff M, Schupbach J, Blayney D, et al: in Gallo RC, Essex M, Gross L (Eds): Human T Cell Leukemia Viruses, Cold Spring Harbor Press, New York, 1984, in press). A much higher correlation between exposure to HTLV-related viruses and the development of AIDS was reported in another study in which sera from ~40% of AIDS and pre-AIDS donors had antibody which reacted with HTLV-I-infected cells. We now believe that this activity results from an antigenic cross-reactivity with HTLV-III envelope antigens (Essex M, McLane MF, Tachibana N, et al: in Gallo RC, Essex M, Gross L (Eds): Human T Cell Leukemia Viruses, Cold Spring Harbor Press, New York, 1984, in press). Virus belonging to the HTLV-II subgroup has been isolated from cultured lymphocytes from an AIDS patient (Popovic M et al, in preparation). This association of HTLV-I and HTLV-II with AIDS materials could be more than coincidental, since both can have effects on immune cell functions.

In addition to our observations, a retrovirus, LAV, was observed in cultured lymphocytes from a patient with lymphadenopathy (Barre-Sinoussi F, Chermann JC, Rey F, et al: Science, 1983, 220(4599):868-871), and additional virus isolates, called IDAV, have been made from other patients with AIDS (Montagnier L, Chermann J, Barre-Sinoussi, et al: in Gallo RC, Essex M, Gross L (Eds): Human T Cell Leukemia Viruses, Cold Spring Harbor Press, New York, 1984, in press). The relationships of these viruses to members of the HTLV family remain to be determined.

We have been able to isolate HTLV-III from the lymphocytes of a large number of AIDS and pre-AIDS patients and have been able to transmit the virus transiently to fresh human T cells and to cell clones of an established cell line. A high correlation was found between exposure to HTLV-III, as detected by antibodies to HTLV-III in patient sera, and the development of AIDS. Based on these observations, we conclude that HTLV-III is the primary cause of AIDS.

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THYMIC TRANSPLANTATION IN AIDS PATIENTS

The course of AIDS, once established, appears to be irreversible. Spontaneous recovery of immunocompetence has never been documented. Marked thymic dysplasia--manifested by destruction of epithelial thymic cells, relative or total absence of Hassall's corpuscles, plasma cell infiltration, and fibrosis--has been observed in autopsy analyses of 19 AIDS patients (Elie R, Laroche AC, Arnoux E, et al: N Engl J Med., 1983,

308:841-842; Seemayer TA, et al: Hum Pathol., 1984, in press). These findings led to the hypothesis that AIDS may be caused by a virus which is harbored by and replicates in the thymus and thymus-derived T cells. A consequence of the viral presence would be that specific populations of cells within the epithelial thymus as well as peripheral T cells would be destroyed.

Given the irreversibility of the immunodeficiency and the alterations observed in thymus tissue, therapeutic attempts with thymus transplants were initiated in June 1983. To date, 12 patients with AIDS have received thymus grafts. Three of these, grafted in Haiti, have been lost to follow up. Data from nine patients grafted in Canada are presented here. Eight of these have been followed at monthly intervals for periods of 1-7 months; one of these patients was lost to follow up.

Thymic epithelial cells and thymic explants used for transplantation were derived from normal thymic tissues excised from infants at cardiac surgery. The tissues were cultured for 2-3 weeks. Each patient received 2.5×10^7-10^8 isolated thymic epithelial cells and 1-3 $\times$ 10^9 thymic explants from a single donor. These were injected (1) intraperitoneally and intramuscularly in the deltoid area (four patients), or, more recently, (2) intrahepatically via the umbilical vein and under the capsule of the rectus abdominus muscle (five patients). Immune reconstitution was assessed clinically with sequential physical examinations, by delayed hypersensitivity skin tests, by enumeration of lymphocyte subpopulations, by measurements of serum interferon levels, and by mitogen stimulation tests. In addition, biopsy samples were taken at the injection sites 2 months after transplantation.

Thymic transplantation was well tolerated in every case. Manifestations of graft-versus-host reactions were never observed. Of the nine patients grafted in Canada, two died, one at 8 weeks and the other at 4½ months after transplantation. Because the former was lost to follow up, the circumstances of death are unknown. The latter died from cerebral hemorrhage shortly after a brain biopsy for the diagnosis of cerebral toxoplasmosis. During the follow-up period, the seven surviving patients have remained stable or have improved clinically. In none of these patients have new opportunistic infections occurred.

Delayed hypersensitivity skin tests remained negative and mitogen stimulation responses and interferon levels did not change significantly. A marked increase occurred in the total number of blood lymphocytes in all patients 2 months after transplantation. There was an increase in total T ($T3^+$ phenotype) lymphocytes; this was due to an increase of $T8^+$ but not of $T4^+$ cells.

Thymic epithelial cells could not be identified histologically with hematoxylin and eosin staining of biopsy samples taken from the injection sites. The apparent absence of thymic tissue 2 months after grafting remains unexplained. It could be due to (1) difficulty in distinguishing thymic cells using standard staining procedures, (2) rejection (a host-versus-graft reaction) mediated by immunological mechanisms and/or by an "F1 hybrid" resistance (NK-like) phenomenon, or (3) thymic cell destruction by the same process (possibly viral) that initially destroyed the thymus. Currently, monoclonal antibodies to thymic epithelial cells are being used to better define the events occurring at the graft sites.

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REPORT OF A LONGITUDINAL PROSPECTIVE STUDY OF A HEALTHY HOMOSEXUAL MALE COHORT IN ROME

A multidisciplinary study was conducted to evaluate the epidemiologic, virologic, and immunologic features of a healthy homosexual male population. The cohort consisted of 55 homosexual men, the members of a cultural club in Rome.

Epidemiologic information collected concerned past medical history (surgery, transfusions, sexually transmitted diseases, diarrhea, viral hepatitis); sexual behaviors (initial sexual activity, kinds of sexual activities, number of sexual partners for each year and in the past year); and use of drugs and medication (alcohol, cigarettes, antibiotics, corticosteroids, street drugs, inhalants).

The following laboratory tests were carried out: (1) isolation of cytomegalovirus (CMV) from urine and semen, (2) detection of anti-CMV antibodies, (3) measurement of T4:T8 lymphocyte ratios, (4) detection of DNA sequences homologous to human T leukemia virus (HTLV) in circulating lymphocytes, (5) detection of hepatitis B virus (HBV) markers, and (6) serologic testing for syphilis.

All subjects underwent clinical examinations. Ages ranged from 21-58 (mean = 30.4) years. Sexual partners per year are shown in the Table. A statistical analysis comparing sexual partners per year and each component of the past medical history did not show any significant associations. However, a high percentage of subjects had positive anamnestic responses for sexually transmitted diseases.

SEXUAL PARTNERS PER YEAR

No. of Subjects	No. of Partners/Year
11	<5
8	6-10
6	11-20
14	21-50
11	51-100
2	101-200
–	201-300
1	301-500
1	>500

In laboratory tests, antibodies against CMV were detected in 81.8% of the sera; CMV was isolated from the urine of four subjects (7.3%) and from the semen of one subject (1.85%). These five patients were all less than 30 years old. HBV markers were present in a greater number of individuals in the study group than in the overall population of the same Italian geographical area (60% vs. 10.5%) (Pasquini P, Kahn HA, Pileggi D, et al: Am J Epidemiol., 1983, 118:699-709). Carriage of HBsAg was very low (1.92%).

HTLV DNA was not found in T cells. T4:T8 ratios ranged from 1.1-2.3 (mean = 1.56).

So far this high risk population has shown neither signs nor symptoms of AIDS. A follow-up study is in progress to promptly catch any changes which may

occur in the health status of these subjects.

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HERPES ZOSTER AND AIDS IN HOMOSEXUAL MEN

I should like to report an epidemic of herpes zoster in homosexual men at risk for AIDS. My private practice consists of approximately 2000 patients. About 90% of my patients are homosexual men. Since 1980, I am aware of 45 patients who have developed AIDS. To date, there have been 18 deaths.

Since April 1982, I have identified 42 new cases of herpes zoster from patients already established in my practice. All of these zoster cases occurred in homosexual men. Most of these men were in their mid-30s. To date, only one of the new zoster cases has developed AIDS, as defined by the Centers for Disease Control (Morb Mort Weekly Rep., 1982, 31:507-514). His zoster was particularly severe; it involved three thoracic dermatomes which took over 12 weeks to heal.

Two of the new zoster cases occurred in men whose lovers had AIDS. At least six of the new zoster cases also had oral thrush at the time of their initial zoster outbreak. In most instances, the thrush has been chronic, persisting long after the zoster has healed. The majority of these new zoster cases have had chronic lymphadenopathy. In many patients, levels of β2-microglobulin were elevated, and the total white cell counts were depressed.

Of the 45 patients who have developed AIDS, four had herpes zoster before the onset of AIDS. Zoster preceded AIDS by 5, 17, 24, and 26 months in these patients.

When specific serologic tests for AIDS are developed, it will be possible to determine which patients with herpes zoster are infected with the AIDS agent. The appearance of a zoster epidemic in the same group of homosexual men at high risk for developing AIDS suggests that an association may exist between the zoster agent and the AIDS agent.

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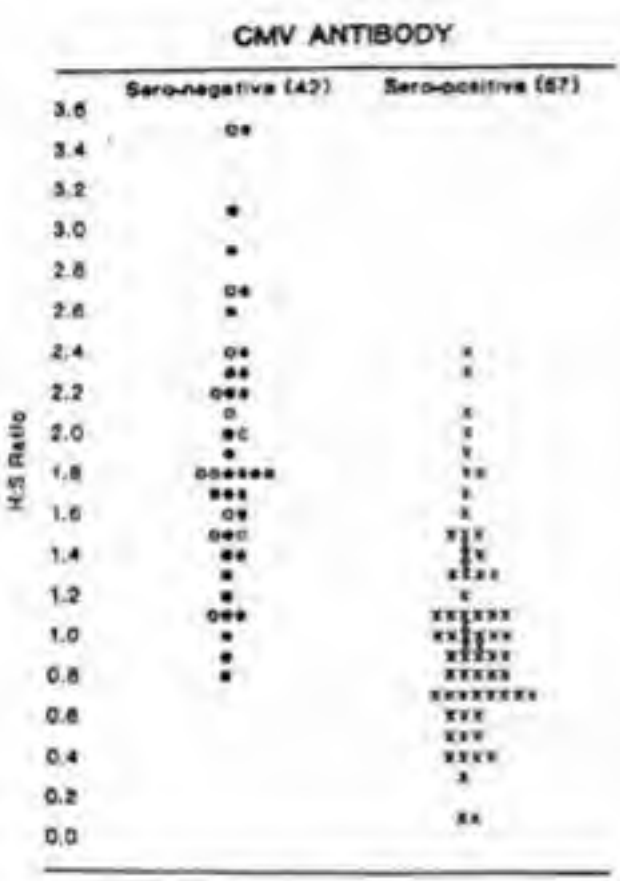
IS CYTOMEGALOVIRUS INFECTION A CAUSE OF ABNORMAL RATIOS OF T LYMPHOCYTE SUBSETS IN HOMOSEXUAL MEN?

To test the hypothesis that cytomegalovirus (CMV) infection is a critical factor in the development of the progressive immunosuppression which eventuates in AIDS, we compared helper:suppressor (H:S) subset ratios with the presence or absence of CMV antibody in homosexual men.

H:S ratios below 1.0 were found in two of 42 (<5%) seronegative men and in 33 of 67 (49%) seropositive men ($p < 0.001$) (Figure).

The results to date of a prospective study of 34 homosexual men seronegative for anti-CMV antibody at the start of the study are summarized in the Table. Nine of the 34 have converted to seropositive, and all have developed H:S ratios <1.0 following acquisition of CMV infections. Two of three seroconverters who have been followed for ≥16 months



Ratio (H:S) of OKT4 or leu3$^+$ (helper) lymphocytes to OKT8 or leu2$^+$ (suppressor, cytotoxic) lymphocytes in homosexual men with and without CMV antibody. •, x = Individuals referred to the U. C. Immunology Laboratory to "rule out AIDS." o = Healthy homosexual men screened at the San Francisco VD Clinic or Health Fair.

have maintained ratios persistently <1.0. Of 23 CMV seronegative individuals who had initial H:S ratios >1.0 and who have remained seronegative, only one has had an H:S ratio <1.0. Only two of nine seroconverters have had any symptoms attributable to the infection.

Two tentative conclusions are suggested by the data presented. (1) Abnormally low T lymphocyte H:S ratios occur almost exclusively in homosexual men who have been infected with CMV and are rarely seen in those who have never been infected with this virus. (2) Asymptomatic CMV infections induce marked and persistent H:S T lymphocyte abnormalities in homosexual men.

These findings do not prove that CMV infections are responsible for immune abnormalities in homosexual men. Those who have escaped infection with CMV may also have avoided exposure to the putative AIDS agent. Since CMV seropositivity in homosexual men correlates with receptive anal intercourse (men who have never been the receptive partner have no greater CMV prevalence than heterosexual men) (Mintz L, Drew WL, Miner RC, et al: Ann Intern Med., 1983, 99:326-329), those who lack CMV antibody may also have avoided exposure to the AIDS agent introduced by the same route.

The observation of a highly significant association between CMV infection and abnormal ratios of T cell subsets is an additional provocative link between CMV and AIDS. CMV infection may be necessary for the development of AIDS, acting as a co-factor in one of several ways. For example, primary CMV infection may induce a transient immunosuppression, permitting subsequent reinfection by other different strains of "wild-type" CMV. Each subsequent CMV infection induces further immunosuppression, ultimately disposing the patient to the development of opportunistic infections or Kaposi's sarcoma. Alternatively, primary CMV infection may induce a transient immunosuppression which permits subsequent infection by the putative AIDS agent. Finally, a preceding

PROSPECTIVE STUDY OF HOMOSEXUAL MEN INITIALLY NEGATIVE FOR CMV ANTIBODY

	H:S Ratio >1.0 Prior to Seroconversion	Average Follow-up Period (mo)	H:S Ratio <1.0 During Follow-up Period
Seroconverters (9)	9/9	6.3	9/9
Persistent seronegatives (25)	23/25	6.6	3/25*

Abbreviations: CMV, cytomegalovirus; H:S, helper:suppressor.

* Includes 2/25 whose ratios were <1.0 in their initial evaluation and have remained <1.0.

infection by another virus, for example, human T cell leukemia virus, may alter the way in which an individual "handles" subsequent CMV infections.

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INVESTIGATION OF AIDS PATIENTS FOR EVIDENCE OF INFECTION WITH THE HUMAN PARVOVIRUS

In 1975, a virus with the morphology of a parvovirus was found in the serum of asymptomatic blood donors (Cossart YE, Field AM, Cant B, et al: Lancet, 1975, 1:72-73). Recent physicochemical studies of the genome of this agent (Summers J, Jones SE, Anderson MJ: J Gen Virol., 1983, 64:2527-2532) and of its polypeptides (Clewley JP: J Gen Virol., 1984, 65:241-245) have shown that this agent fulfills the requirements for classification as an autonomous member of the Parvoviridae family.

Initially, infection with this human parvovirus (HPV) was believed to be largely asymptomatic or associated with nonspecific febrile illnesses (Shneerson JM, Mortimer PP, Vandevelde EM: Br Med J., 1980, 280(6231):1580). Currently, evidence is accumulating to suggest that the common clinical manifestation of primary HPV infection is erythema infectiosum or Fifth disease (Anderson MJ, Jones SE, Fisher-Hoch SP, et al: Lancet,

1983, 1:1378; Anderson MJ, Lewis E, Kidd IM, et al: J Hyg., 1984, in press). The severe complication of HPV infection in individuals with chronic hemolytic anemia, aplastic crisis, is now well recognized (Rao KRP, Patel AR, Anderson MJ, et al: Ann Intern Med., 1983, 98:930-932; Anderson MJ, Davis LR, Hodgson J, et al: J Clin Pathol., 1982, 35:744-749; Kelleher JF, Luban NLC, Mortimer PP, et al: J Pediatr., 1983, 102:720-722; Duncan JR, Cappellini MD, Anderson MJ, et al: Lancet, 1983, 2:14-16).

Parvoviruses are probably ubiquitous among mammalian species. They have an absolute requirement for host cells to be in S phase of growth, and this has been demonstrated frequently in tissue culture. It is also reflected in the pathogenesis of the disease in host animals, where tissues composed of dividing cells constitute the target organs. Thus, in patients with chronic hemolytic anemia, infection of the red cell precursors in the hyperactive bone marrow leads to severe anemia. In both canine and feline species, transient leucopenia is a feature of infection. A similar phenomenon may occur in human infections (Shneerson JM, Mortimer PP, Vandevelde, EM: Br Med J., 1980, 280(6231):1580). These observations, together with the fact that HPV has been shown to be transmissible in blood and blood products (Mortimer PP, Luban NLC, Kelleher JF: Lancet, 1983, 2:482-484), prompted us to investigate AIDS patients for evidence of infection with HPV.

The study group comprised 50 patients with AIDS from St. Luke's-Roosevelt Hospital Center in New York City. Control groups comprised 20 heterosexual controls, 10 homosexual men with lymphadenopathy, 20 asymptomatic homosexual men, and 10 male homosexuals with chronic diarrhea of 3 months or more duration. Serum specimens were stored at -70°C prior to testing. Sera were examined for parvovirus DNA by the "dot blot" method (Mason WS, Aldrich C, Summers J, et al: Proc Natl Acad Sci., 1982, 79:3997-4001) using a ^{32}P-labeled cloned portion of HPV genome as probe (Anderson MJ, Jones SE, Minson AC, manuscript in preparation). This test is capable of detecting 10^3 genome copies in serum specimens. Sera were also examined for parvovirus-specific IgM (Cohen BJ, Mortimer PP, Pereira MS: J Hyg., 1983, 91:113-130).

HPV DNA was not detected in any specimen. Only one specimen contained detectable IgM antibody. This was a specimen obtained from a homosexual man in the control group. Thus, no evidence of current or recent infection with HPV was found among the AIDS cases.

In order to evaluate past exposure of AIDS patients and controls to HPV, sera were examined for parvovirus-specific IgG (Ibid) (Table 1). Anti-parvovirus IgG antibody was less common among AIDS patients than controls, and the titers in the AIDS group were, on the whole, lower. A history of parvovirus infection thus appeared less common among AIDS patients than among controls. The observation that mean titers were lower in AIDS patients raised the possibility of virus-specific immunosuppression in these patients.

To investigate this possibility, all sera were tested for the presence of rubella-specific antibody by hemolysis in gel (Kurtz JB, Mortimer PP, Mortimer PR, et al: J Hyg., 1980, 84:213-222) (Table 2). The pattern of results for anti-rubella antibodies was similar to the pattern for anti-parvovirus antibodies: both types of antibodies were less common and the mean titers were lower in AIDS patients than in controls.

The rubella virus is not considered a good candidate etiologic agent for AIDS.

TABLE 1

IgG ANTIBODY TO HUMAN PARVOVIRUS

Group	Number	Neg	Percent with Stated Amount of Antibody			
			1.3-3.7*	3.8-11	11.1-33	30-100
AIDS	50	36	24	28	12	—
Homosexuals (lymphadenopathy)	10	20	20	60	—	—
Homosexuals (diarrhea)	10	30	20	10	30	10
Homosexuals (asymptomatic)	20	20	20	45	15	—
Heterosexual controls	20	15	30	25	15	15

* Antibody measured in radioimmunoassay and expressed in arbitrary units.

TABLE 2

IgG ANTIBODY TO RUBELLA VIRUS

Group	Number	Neg	Percent with Stated Amount of Antibody			
			8-9*	10-11	12-13	14-15
AIDS	50	22	22	28	26	2
Homosexuals (lymphadenopathy)	10	10	—	20	60	10
Homosexuals (diarrhea)	10	—	10	30	40	20
Homosexuals (asymptomatic)	20	10	5	25	55	5
Heterosexual controls	20	10	—	35	45	10

* Hemolysis zone: diameter in mm.

The similarities in patterns of anti-rubella and anti-parvovirus antibody prevalences and titers suggest, by analogy, that infection with the human parvovirus is not etiologically associated with the development of AIDS.

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AIDS CASES REPORTED TO THE CENTERS FOR DISEASE CONTROL AS OF May 28, 1984

UNITED STATES CASES

DISEASE	CASES	PERCENT OF TOTAL	DEATHS	PERCENT DEAD
KS without PCP	1153	25.0	279	24.2
PCP without KS	2403	52.1	1129	47.0
Both KS and PCP	299	6.5	193	64.5
OI without KS or PCP	760	16.5	398	52.4
TOTAL	4615	100.0	1999	43.3

KS = Kaposi's sarcoma
OI = Opportunistic infection
PCP = Pneumocystis carinii pneumonia

	MALES		FEMALES		TOTAL	
RISK GROUPS*	CASES	% OF TOTAL	CASES	% OF TOTAL	CASES	%
Homosexual or bisexual	3328	77.3	0	0.0	3328	72.1
IV drug user	621	14.4	172	55.3	793	17.2
Haitian	154	3.6	27	8.7	181	3.9
Hemophiliac	33	0.8	0	0.0	33	0.7
No apparent risk group or unknown	168	3.9	112	36.0	280	6.1
TOTAL	4304	100.0	311	100.0	4615	100.0

* The risk groups listed are hierarchically ordered; cases with multiple risk factors are tabulated only in the risk group listed first.